

CLAIMS

What is claimed:

1. An apparatus comprising:

an actuator having a first component with at least one opening and a passageway therein connected to the at least one opening and a second component housed within the passageway being movable between first and second positions within the passageway, the second component dividing the passageway into first and second portions and sealing the first portion from the second portion;

at least one sensor to detect a position of the second component within the passageway; and

a pump system having at least one pump and a controller, the at least one pump being connected to the at least one opening supplying a fluid to the first portion of the passageway, the fluid applying a first force onto the second component, moving the second component between the first and second positions at a first speed, the controller being connected to the at least one pump and the at least one sensor, the controller controlling the at least one pump to change the supply of fluid to the first portion of the passageway to apply a second force onto the second component, moving the second component between the first and second positions at a second speed.

2. The apparatus of claim 1, wherein the first force is greater than the second force.
3. The apparatus of claim 2, wherein the first speed is greater than the second speed.
4. The apparatus of claim 3, wherein the first component of the actuator has first and second openings, the passageway interconnects the openings, the first opening is adjacent to the first portion of the passageway, and the second opening is adjacent to the second portion of the passageway.
5. The apparatus of claim 4, wherein the first component of the actuator is a cylinder and the second component of the actuator is a piston within the cylinder.
6. The apparatus of claim 5, wherein said movement of the piston between the first and second positions of the passageway within the cylinder is substantially linear.
7. The apparatus of claim 6, wherein there are a plurality of sensors.
8. The apparatus of claim 7, wherein the sensors are electromagnetic.

9. The apparatus of claim 7, wherein the sensors are optical.
10. The apparatus of claim 9, wherein the fluid is air.
11. The apparatus of claim 10, wherein the at least one pump is connected to the first and second openings and further comprising a switch interconnecting the at least one pump and the cylinder, the controller being connected to the switch.
12. The apparatus of claim 11, wherein the controller controls the switch to change the supply of fluid between the first opening and the second opening when the piston is in the second position.
13. The apparatus of claim 12, further comprising first and second pumps, the first pump being connected to the first opening and the second pump being connected to the second opening, the controller being connected to the first and second pumps.
14. The apparatus of claim 13, wherein the controller controls the first and second pumps to change the supply of fluid between the first opening and the second opening when the piston is in the second position.

15. A semiconductor substrate processing apparatus comprising:
- a frame;
 - a substrate support mounted to the frame to support a semiconductor substrate;
 - a dispense arm mounted to the frame for movement relative to the substrate support;
 - a dispense arm actuator having a first component with an opening and a passageway therein connected to the opening and a second component housed within the passageway being movable between first and second positions within the passageway, the second component dividing the passageway into first and second portions and sealing the first portion from the second portion, at least one of the components being connected to the frame and at least one of the components being connected to the dispense arm;
 - at least one sensor coupled to the dispenser arm actuator to detect a position of the second component within the passageway; and
 - a pump system having a pump and a controller, the pump being connected to the opening and supplying a fluid to the first portion of the passageway, the fluid applying a first force onto the second component to move the second component between the first and second positions at a first speed, the controller being connected to the pump and the at least one sensor, the controller controlling the pump to change the supply of fluid to the first portion of the passageway, when the second component is in a selected position within the passageway, to apply a second

force onto the second component to move the second component between the first and second positions at a second speed, the second component stopping in the second position in the passageway.

16. The semiconductor substrate processing apparatus of claim 15, wherein the first force is greater than the second force.

17. The semiconductor substrate processing apparatus of claim 16, wherein the first speed is greater than the second speed.

18. The semiconductor substrate processing apparatus of claim 17, wherein the first component of the actuator has first and second openings, the passageway interconnects the openings, the first opening is adjacent to the first portion of the passageway, and the second opening is adjacent to the second portion of the passageway.

19. The semiconductor substrate processing apparatus of claim 18, wherein the wafer support has a surface in a plane and the dispense arm is mounted to the frame for translating in a direction transverse to the plane.

20. An actuator comprising:

a main body having first and second openings and a passageway therethrough interconnecting the first and second openings;

a pump system having at least one pump and a controller, the at least one pump being connected to the first and second openings

at least one sensor coupled to the main body; and

a piston housed within the passageway being movable between a first position and a second position, the piston dividing the passageway into first and second portions and sealing the first portion from the second portion, the first opening being connected to the first portion and the second opening being connected to the second portion, the piston moving from the first position to the second position at a first speed when the at least one pump applies a first pressure to the first portion of the passageway, the piston moving from the first position to the second position at a second speed when the at least one pump applies a second pressure to the first portion of the passageway, the piston moving from the second position to the first position at a third speed when the at least one pump applies a third pressure to the second portion of the passageway, and the piston moving from the second position to the first position at a fourth speed when the at least one pump applies a fourth pressure to the second portion of the passageway.

21. The actuator of claim 20, wherein the first pressure is greater than the second pressure and the third pressure is greater than the fourth pressure.

22. The actuator of claim 21, wherein the first speed is substantially the same as the third speed and the second speed is the substantially the same as the fourth speed.

23. A method comprising:

supplying a fluid to a passageway of a first component of a fluid induced actuator, the fluid applying a first force on a second component within the passageway, the second component moving within the passageway at a first speed; and

changing said supply of fluid to the passageway, said reduced supply of fluid applying a second force on the second component within the passageway, the second component moving within the passageway at a second speed.

24. The method of claim 23, wherein the first force is greater than the second force.

25. The method of claim 24, wherein the first speed is greater than the second speed.